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STRUCTURED ANALYSIS

LSA TASK 301

FUNCTIONAL REQUIREMENTS IDENTIFICATION

SUBTASK 301.2.5

DESIGN ALTERNATIVES

APJ 966-231

APJ

MILITARY & SCIENTIFIC RESEARCH

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This report is one of a series presenting the Structured Analysis for the Logistic Support Analysis (LSA) Task and the Intergrated Logistic Support (ILS) Element. Included in this report is the System Analysis for the LSA Task and the ILS Element, "Participate in Formulating Design Alternatives", with the corresponding description of the processes, data flows, data stores, external entities involved on each DFD. An overview of the ILS Element analysis procedures, and a guide to the overall process development, as well as a brief overview of the Structured Analysis, its place in the overall systems development process, and a brief working description of the Structured Systems Analysis Fundamentals.

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APJ 966-231

STRUCTURED ANALYSIS

LSA TASK 301

FUNCTIONAL REQUIREMENTS IDENTIFICATION

SUBTASK 301.2.5

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DESIGN ALTERNATIVES

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HQ US AMCCOM

INTEGRATED LOGISTIC SUPPORT OFFICE
AMSMC-LSP
ROCK ISLAND, IL

by

AMERICAN POWER JET COMPANY

RIDGEFIELD, NJ — **FALLS CHURCH, VA**

FT. EUSTIS, VA — **ST. LOUIS, MO**

April 1989

FOREWORD

APJ, under contract to HQs, AMCCOM, has initiated the automation of the LSA Tasks (MIL-STD-1388-1) and the assessment of the ILS elements (AR 700-127). A major goal is to unify military and contractor approach to the performance of ILS and LSA.

Detailed to meet all requirements of ILS and LSA, the automated process will continue to provide the flexibility in selecting tasks and elements to be addressed at each life cycle stage. A major advantage of this approach is to insure that the application of each task element is consistent with prescribed Army policies and procedures.

This report is one of a series presenting the Structured Analysis of the respective LSA Task and ILS Element. Structured Analysis comprises a description of the process being automated in terms which facilitate system design and subsequent programming. It is increasingly the preferred approach in both industry and Government.

This Technical Note reports on the Data Flow Diagrams (DFDs) of LSA Task Subtask 301.2.5, "Participate in Formulating Design Alternatives" and provides definitions of the processes, data flows, data stores, and external entities involved on each DFD (Annexes A and B). The report provides an overview of the LSA Task analysis procedures and a guide to the overall process development.

To view this work in context, this report also presents a brief overview of Structured Analysis and its place in the overall systems development process. Additionally, Annex C provides a brief working description of Structured Systems Analysis Fundamentals. The overview and certain portions of the introductory text are repeated verbatim in every report in this series so that each report is free standing.

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INTRODUCTION

PURPOSE

The purpose of this report series is to present the results of the APJ efforts under Contract DAAA21-86-D-0025 for coordination with the AMCCOM Program Manager prior to in-depth programming of ILS and LSA functions and processes. "Participate in Formulating Design Alternatives" (LSA Subtask 301.2.5) is addressed in this report.

BACKGROUND

The Department of the Army has a requirement for management control over contractor and Government agency response to the requirements of AR 700-127, "Integrated Logistic Support", and MIL-STD-1388-1, "Logistic Support Analysis". HQs AMCCOM has initiated action to structure each of the LSA tasks, the assessment of each ILS element, the form of the results, and the detailed processes to insure consistency with current Army policies, procedures, and techniques. This approach (undertaken by AMCCOM and APJ) will insure uniformity in efforts and products, reproducibility of analyses, and a well-defined structure which can be coordinated among all participants in the logistic process to arrive at common understanding and procedures.

SCOPE

This report summarizes the results of the Structured Analysis of LSA Task 301, "Functional Requirements Identification", Subtask 301.2.5, "Participate in Formulating Design Alternatives", and presents the associated Data Flow Diagrams (DFDs) developed from the Structured

Analysis. The portions of the Data Dictionary relating to labels, names, descriptions, processes, data flows, data stores, and external entities are included in their present degree of completeness. (The Data Dictionary is a "living document" that evolves through analysis and design process).

To place this work in context, this report presents a brief overview of Structured Analysis and its place in the overall systems design process to assist the reader who may not be fully briefed on the symbols and conventions used. It is supported by Annex C, which defines each element in Structured Analysis.

LSA SUBTASK 301.2.5 DESCRIPTION

LSA Subtask 301.2.5. concerns logistics performance in the formulation and logistic evaluation of design alternatives established to correct design requirements or operations and maintenance task requirements. In the same way, design

alternatives which reduce or simplify functions requiring logistic support resources, shall be analyzed. Task inputs stated by MIL-STD-1388-1A are as follows:

1. Any documentation requirements over and above LSAR data such as functional flow diagrams or design recommendation data resulting from the task identification process.

2. Identification of system/equipment hardware and software on which this task will be performed and the indenture levels to which this analysis will be carried.

3. Identification of the levels of maintenance which will be analyzed during performance of this task to identify functions and tasks.

4. Description of system/equipment concepts under consideration

5. FMECA results

6. Use study results from Task 201.

Task output comprises the identification of design deficiencies requiring redesign as a result of the functional requirements and operations and maintenance task identification process.

The task definitions for the LSA Task 301 and the LSA subtask 301.2.5 descriptions from MIL-STD-1388-1A are presented as Annex A.

APPROACH

The APJ approach to Structured Analysis of the LSA task is:

1. Scope the process defined in MIL-STD-1388-1A in the context of tne other LSA tasks.

2. Review the guidance provided in AMC PAM 700-11, "Logistics Support Analysis Review Team Guide".

3. Review the applicable Data Item Descriptions (DIDs) from the Acquisition Management Systems and Data Requirements Control List (AMSDL) published by the Department of Defense.

4. Review all source documents referenced in the AMSDL as applicable to the referenced DIDs of interest.

5. Apply staff experience in logistics support analysis to assure that the intent of the task has been addressed.

6. Validate results in discussions with Army activities and personnel directly involved in the applicable or related LSA tasks.

Structured Analysis and preparation of Data Flow Diagrams (DFDs) was further assisted by the application of Structured Analysis software. Licensed by Index Technology Corporation, Excelerator provides for automated tracking of names, labels, descriptions, multiple levels of detail in the data flow diagrams, and industry standards in symbols and diagramming practices.

Following completion of the draft DFDs, the diagrams and data dictionary were made available to working Army logisticians currently (or recently) directly involved in the application of the same LSA tasks in current Army development programs.

Comments were solicited relative to the logic of the processes described, the scope and details of the indicated approaches, and the outputs implied by the LSA task requirements.

Draft products were well received by the external reviewers, and requests have been made for copies of the DFDs for in-house use in organizing ILS and LSA efforts. Comment was also received that the DFDs will be a useful training tool for apprentice logisticians, since they provide an overall picture of the total task and a uniform approach to its fulfillment.

STRUCTURED ANALYSIS AND DESIGN:

Structured Analysis and Structured Systems Design evolved from the need to define and demonstrate the underlying logical functions and requirements of large systems. The concept of Structured Analysis involves building a logical (non-physical) model of a system, using graphic techniques which enable users, analysts, and designers to get a clear and common picture of the system and how its parts fit together to meet the user's needs. It is followed by structured design, and then by programming, and test and validation. Annex C provides a brief description and guide to the fundamentals of a Structured Systems Analysis.

The Structured Analysis and Structured Systems Design process, sometimes referred to as "Structured Systems Analysis

and Design (SSAD)", is well documented and widely utilized in Government and industry.

As stated in "The Practical Guide to Structured Systems Design" (Meilir Page-Jones, Prentice-Hall, Englewood Cliffs, NJ, 1980):

..."Structured Design is disciplined approach to computer system design, an activity that in the past has been notoriously haphazard and fraught with problems.

"1. Structured Design allows the form of the problem to guide the form of the solution.

"2. Structured Design seeks to conquer the complexity of large systems by means of partitioning the system into "black boxes," and by organizing the black boxes into hierarchies suitable for computer implementation.

"3. Structured Design uses tools, especially graphic ones, to render systems readily understandable.

"4. Structured Design offers a set of strategies for developing a design solution from a well defined statement of a problem.

"5. Structured Design offers a set of criteria for evaluating the quality of a given design solution with respect to the problem to be solved.

"Structured Design produces systems that are easy to understand, reliable, flexible, long lasting, smoothly developed, and efficient to operate - and that WORK...."

The organization of Structured Analysis and its relationship to Structured System Design is shown on Figure 1.

LSA SUBTASK 301.2.5 - DATA FLOW DIAGRAMS

The Data Flow Diagram is a tool that shows flow of data,

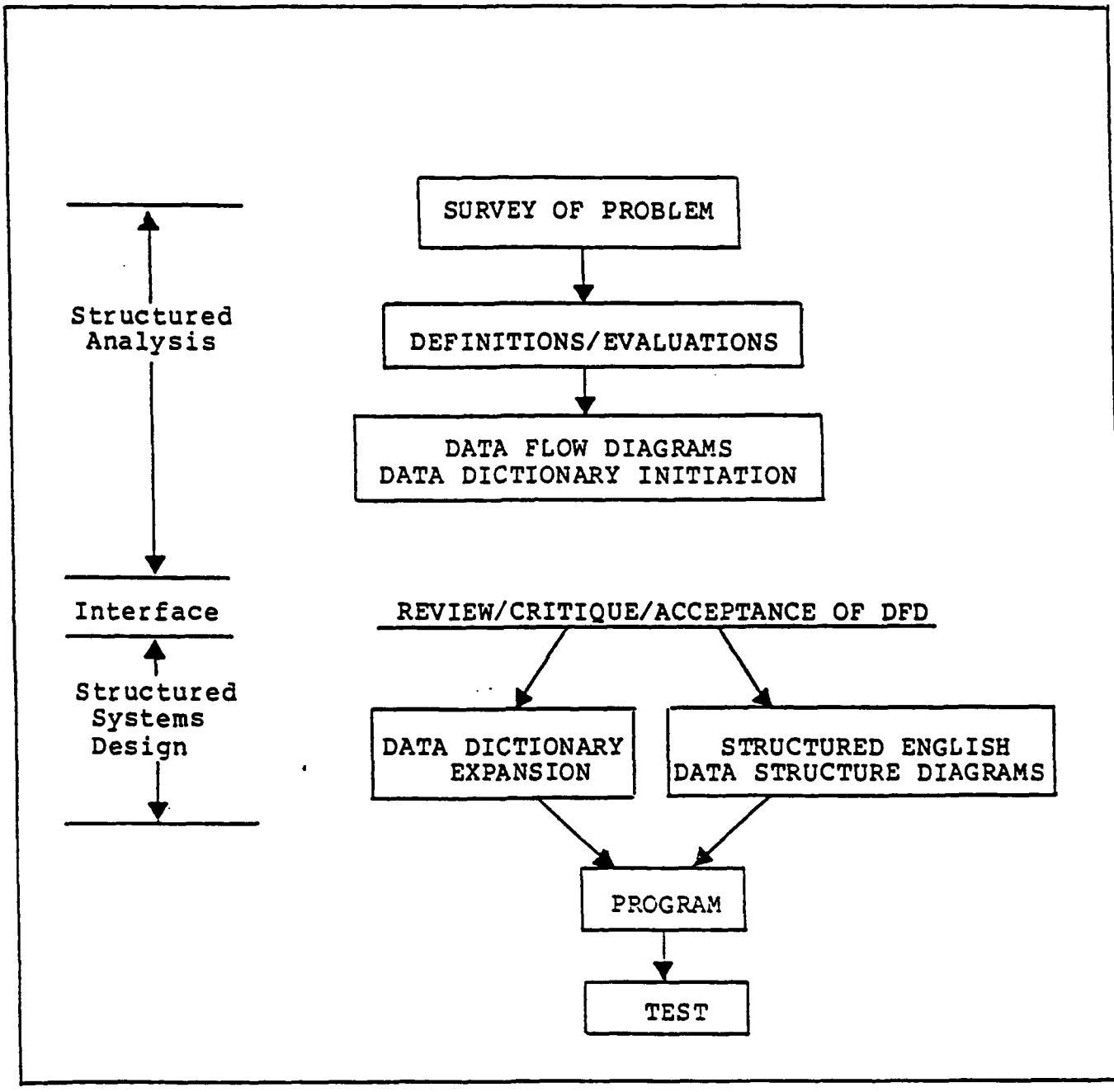


Figure 1. Structured Analysis and Structured Systems Design Organization

i.e., data flows from sources and is processed by activities to produce intermediate or final products.

The DFD provides a useful and meaningful partitioning of a system from the viewpoint of identification and separation of all functions, actions, or processes so that each can be introduced, changed, added, or deleted with minimal disruption of the overall program, i.e., it emphasizes the underlying concept of modularity and identifiable transformations of data into actionable products.

Two (2) DFDs have been developed to structure the LSA subtask relative to participation in the formulations and logistic evaluation of design alternatives:

1. 301.2.5 Overview (or Top Level)
2. 301.2.5.1A Identify Design Deficiencies

Each DFD is keyed to the specific task (LSA, in this case) through the identification number assigned in the lower right hand box. The Alpha codes indicate the level of indenture or explosion below the top level, i.e.,:

Top Level.....LSA DFD 301.2.5

First Indenture.....LSA DFD 301.2.5.1A

Each DFD makes reference to the basic LSA task it addresses, as well as the level of indenture (explosion) of the DFD. For example, the first or top level DFD, "301.2.5", refers to the paragraph in MIL-STD-1388-1A which describes the task. One of the

processes (bubbles) on the top level diagram (301.2.5.1, Consolidate Deficiency in OPS/SUP Functional Report) is expanded and identified as "301.2.5.1A", a second level of 301.2.5.1 (Alpha "A" indicates the second level).

Four standard symbols are used in the drawing of a DFD (see Figure 2).

A copy of each DFD is presented in Annex B, accompanied by the Data Dictionary process elements. Each entry made in the DFDs has a corresponding entry in the Data Dictionary, immediately following each of the DFDs.

This Technical Note presents only those Data Dictionary entries necessary for the coordination of the overall concept and details of the processes. To facilitate review of the diagrams, data flow identifications, process, external entities and data store descriptions are provided.

As the DFDs progress through Structured System Design, the Data Dictionary will continue to be expanded and completed. Since they are working documents rather than final submissions, only minimum effort has been devoted to editorial niceties, e.g., spelling, typography, etc.

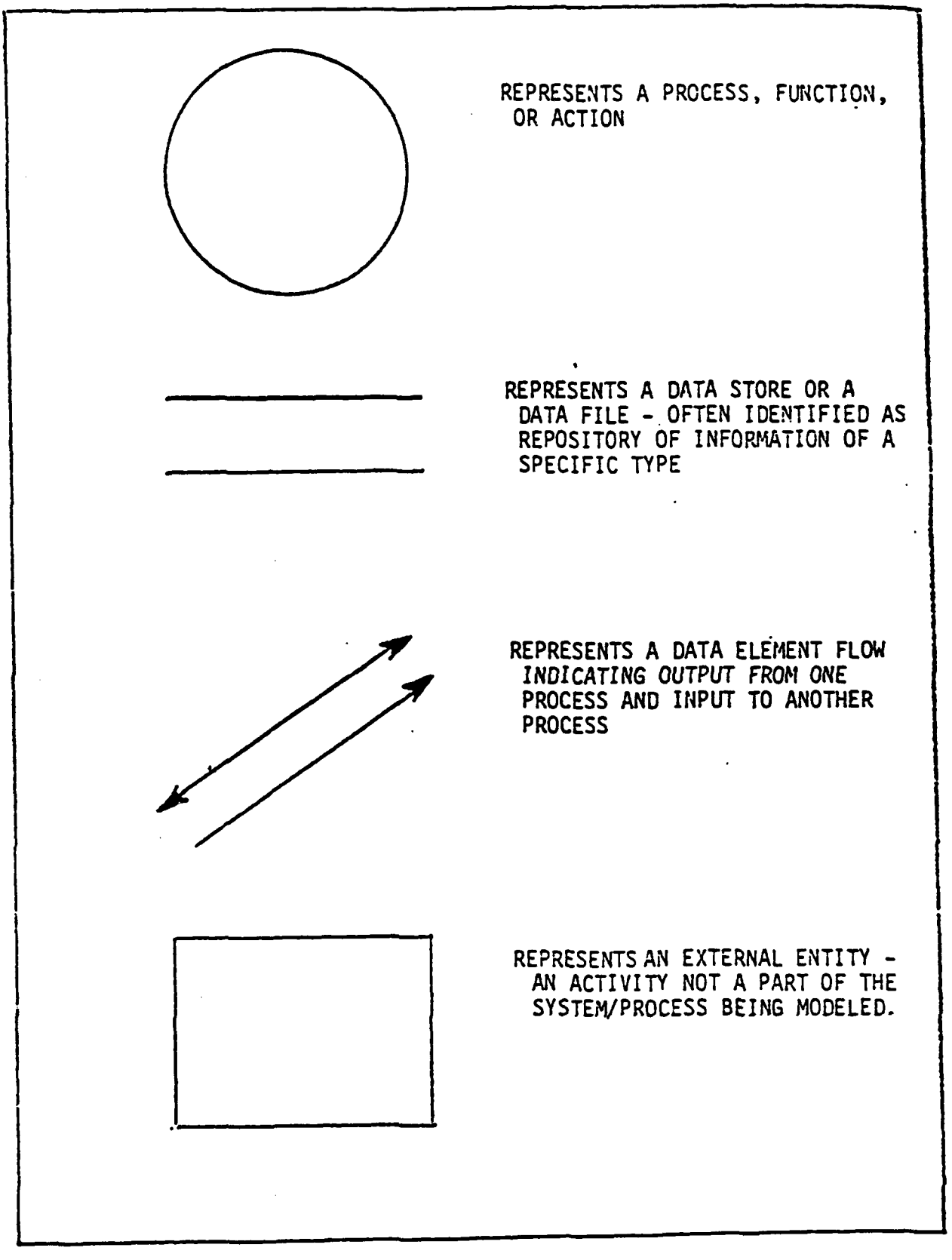


Figure 2. STANDARD DFD SYMBOL DEFINITIONS

ANNEX A

LSA TASK 301

FUNCTIONAL REQUIREMENTS IDENTIFICATION

ANNEX A

LSA TASK 301

FUNCTIONAL REQUIREMENTS IDENTIFICATION 1/

301.1 PURPOSE: To identify the operations and support functions that must be performed for each system/equipment alternative under consideration and then identify the tasks that must be performed in order to operate and maintain the new system/equipment in its intended environment.

301.2 TASK DESCRIPTION:

301.2 Participate in formulating design alternatives to correct design deficiencies uncovered during the identification of functional requirements or operations and maintenance task requirements. Design alternatives which reduce or simplify functions requiring logistic support resources shall be analyzed.

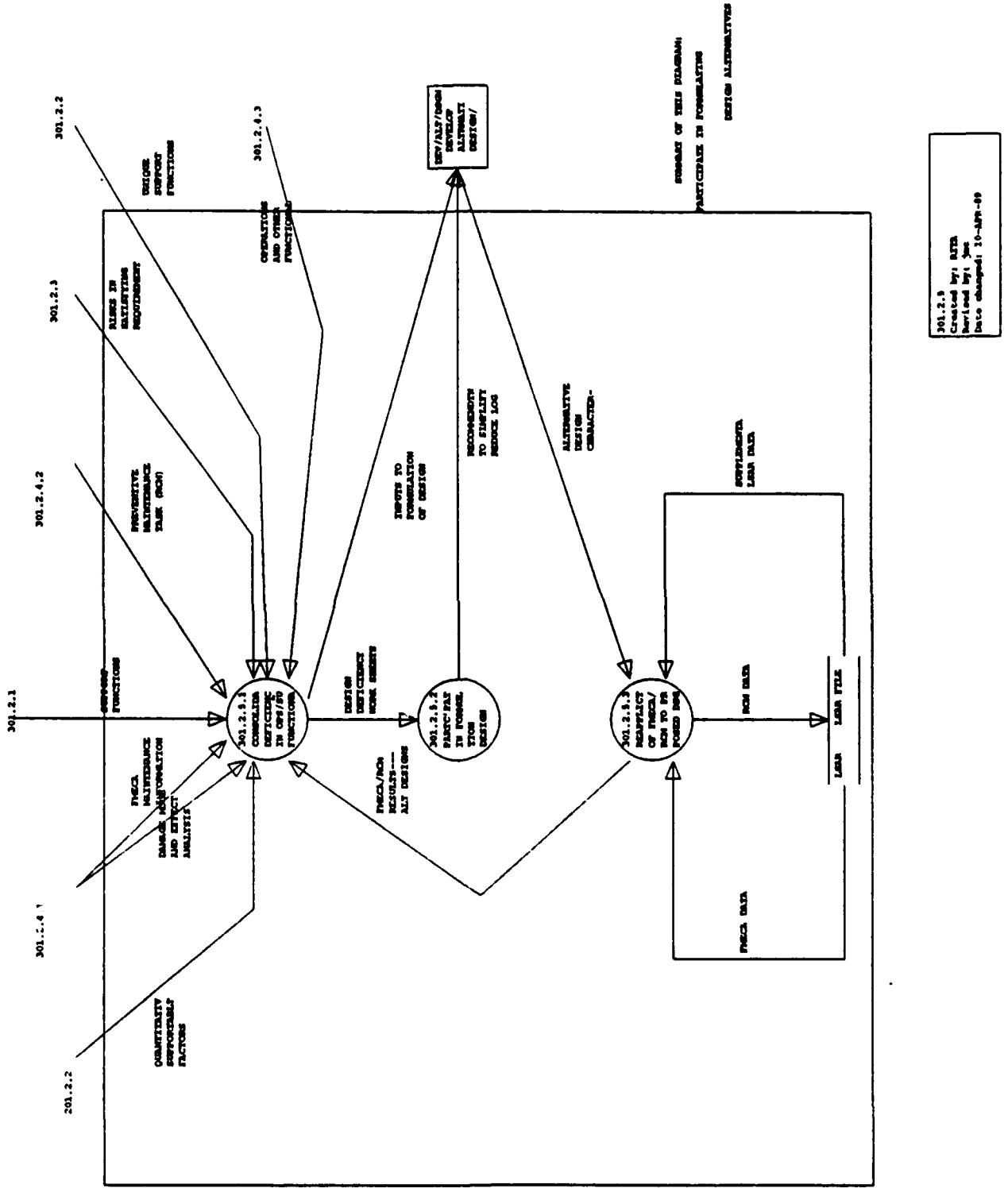
1/ Abstracted verbatim from MIL-STD-1388-1A, April 11, 1983, Pages 36-37.

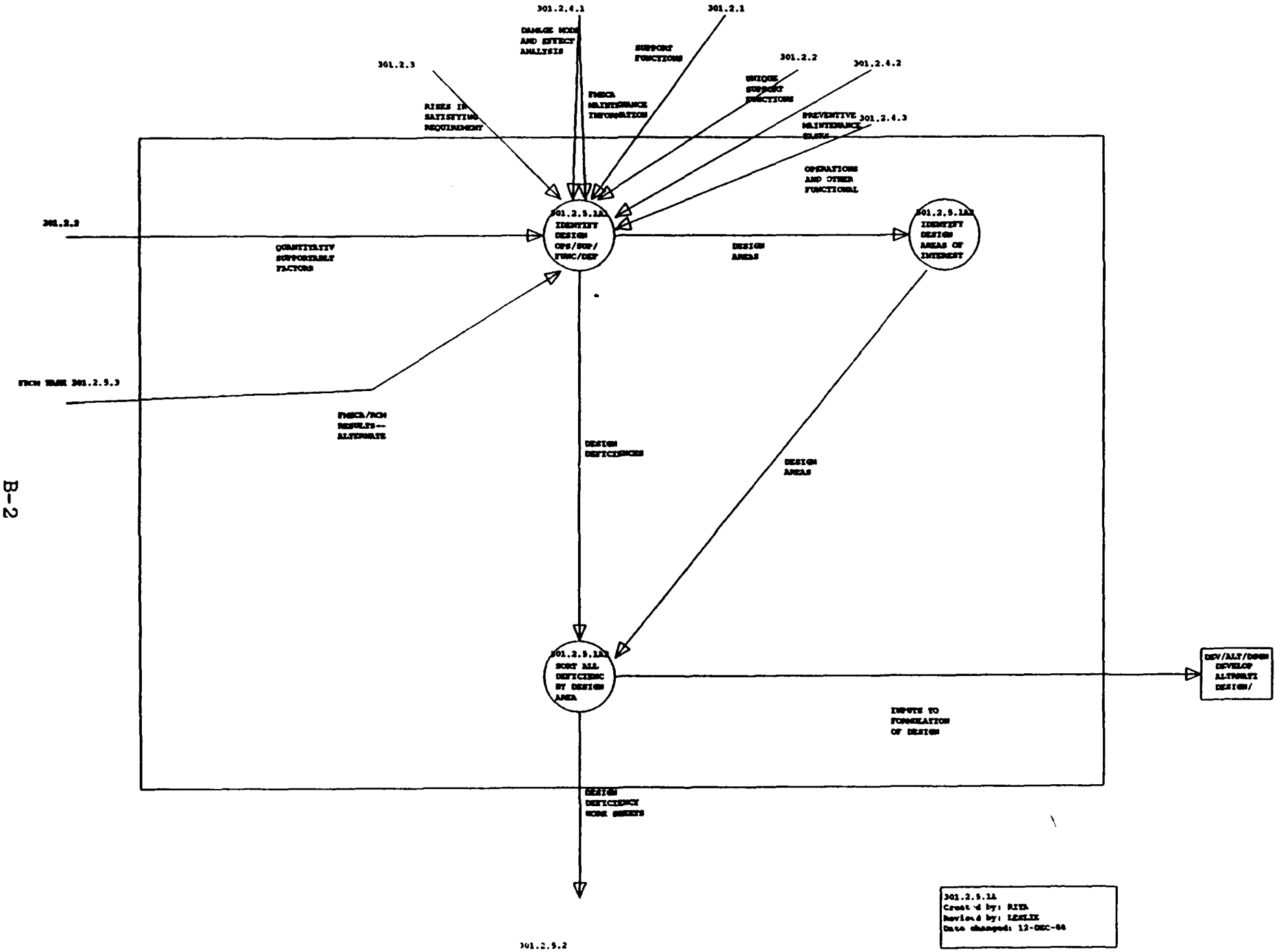
ANNEX B

PARTICIPATION IN FORMULATING DESIGN ALTERNATIVES

SUBTASK 301.2.5

DATA FLOW DIAGRAMS AND PROCESS DATA DICTIONARY


301.2.2
DESIGN SUPPORT FUNCTIONS
301.2.4.3
OPERATIONS AND OTHER FUNCTIONS
DEV/ALT/DSGN DEVELOP ALTERNAT DESIGN/
BUDGET OF TEST PROGRAM; PARTICIPATE IN FORMULATING DESIGN ALTERNATIVES
301.2.3
ALERT IN EXISTING REQUIREMENT
301.2.4.2
PREVENTIVE MAINTENANCE TASK (MCH)
INPUTS TO FORMULATION OF DESIGN
RECOMMENDATN TO SIMPLIFY REDUCE LCC
ALTERNATIVE DESIGN CHARACTER-
SUPPLEMENTAL LSAR DATA
301.2.1
SUPPORT FUNCTIONS
301.2.5.1 CONDUCTING DEFICIENCY IN OPS/SP FUNCTIONS
DESIGN DEFICIENCY WORK SHEETS
301.2.5.2 PARTICIPATE IN FORMULATION DESIGN
301.2.5.3 REANALYSIS OF FMECA/ MCH TO PE POSED DSG
MCH DATA
LSAR FILE
LSAR
FMECA/MCH RESULTS--- ALT DESIGNS
FMECA MAINTENANCE ACTION
DANGER HUMAN EFFECT ANALYSIS
FMECA DATA
301.2.4.1
CONSTRAINTS RESPONSIBLE FACTORS
301.2.2
301.2.5
Created by: RTA
Revised by: jms
Date changed: 10-APR-89


301.2.4.1
301.2.1
DAMAGE MODE AND EFFECT ANALYSIS
SUPPORT FUNCTIONS
301.2.3
301.2.2
301.2.4.2
UNIQUE SUPPORT FUNCTIONS
RISKS IN SATISFYING REQUIREMENT
FMECA MAINTENANCE INFORMATION
PREVENTIVE MAINTENANCE TASKS
301.2.4.3
OPERATIONS AND OTHER FUNCTIONAL
301.2.2
IDENTIFY DESIGN OPS/SUP/ FUNC/DEP
IDENTIFY DESIGN AREAS OF INTEREST
QUANTITATIV SUPPORTABILT FACTORS
DESIGN AREAS
FROM TASK 301.2.5.3
FMECA/RCM RESULTS-- ALTERNATE
DESIGN DEFICIENCES
DESIGN AREAS
SORT ALL DEFICIENC BY DESIGN AREA
DEV/ALT/DSGN DEVELOP ALTERNATI DESIGN/
INPUTS TO FORMULATION OF DESIGN
DESIGN DEFICIENCY WORK SHEETS
301.2.5.1A
Created by: RITA
Revised by: LESLIE
Date changed: 12-DEC-04
301.2.5.2

Name	Label	Description
301.2.5.1	CONSOLIDAT DEFICIENCY IN OPS/SUP FUNCTIONAL RQMNTS	THIS PROCESS CONSOLIDATES DESIGN DEFICIENCIES UNCOVERED DURING THE IDENTIFICATION OF FUNCTIONAL REQUIREMENTS ANALYSIS (TASK 301.2.1), AND THE OPERATIONAL AND MAINTENANCE TASK REQUIREMENTS (TASK 301.2.4.1, 301.2.4.2, & 301.2.4.3) CONSIDERING THE RISKS IDENTIFIED DURING THE RISK ANALYSIS (TASK 301.2.3). SEE EXPLOSION DFD 301.2.5.1A1 FOR DETAILED PROCESSES RELATED TO THIS PROCESS.
301.2.5.1A1	IDENTIFY DESIGN OPS/SUP/ FUNC/DEF	ACRONYN: LSA - LOGISTIC SUPPORT ANALYSIS DOCUMENTATION GENERATED AS A RESULT OF THE LSA TASKS SHOWN AS INPUTS TO THIS PROCESS IN DATA FLOW DIAGRAM 301.2.5A ARE REVIEWED AND ANALYZED TO IDENTIFY AND DOCUMENT THE EXISTENCE OF DESIGN DEFICIENCIES OR SYSTEM/EQUIPMENT CHARACTERISTICS SHOWN TO BE SUPPORT RESOURCE INTENSIVE.
301.2.5.1A2	IDENTIFY DESIGN AREAS OF INTEREST	THE SYSTEM/EQUIPMENT DESIGN DEFIECIENCIES DOCUMENTATION, DEVELOPED IN PROCESS 301.2.5.1A1, ARE REVEIWED, ANALYZED AND CATEGORIZED INTO THE DESIGN AREA OF INTEREST INCLUDING BUT NOT LIMITED TO THE FOLLOWING: 1) MATERIELS 2) TECHNOLOGY 3) OPERATIONS 4) OPERATIONAL LIMITS 5) ENVIRONMENTAL CRITERIA.
301.2.5.1A3	SORT ALL DEFICIENCS BY DESIGN AREA	THIS PROCESS SORTS THE DESIGN DEFICIENCIES AND ESTABLISHED DESIGN CATEGORIES ACCORDING TO THE SEVERITY OF THE DEFICIENCY, AND PROJECTS THE RESOURCES REQUIRED TO OVERCOME THE DEFICIENCY. THIS DATA WILL BE THE BASIS FOR FORMULATING DESIGN ALTERNATIVES TO CORRECT DEFICIENCIES IN THE MOST COST-EFFECTIVE MANNER.
301.2.5.2	PARTC'PATE IN FORMULA TION DESIGN ALTERNATIV	ACRONYM: ILS - INTEGRATED LOGISTIC SUPPORT THIS PROCESS INVOLVES PARTICIPATION IN A DESIGN REVIEW, FORMULATING DESIGN ALTERNATIVES TO CORRECT DESIGN DEFICIENCIES. ITS GOAL IS TO REDUCE OR SIMPLIFY FUNCTIONS REQUIRING LOGISTIC SUPPORT RESOURSES TO PROVIDE THE BEST RETURN ON THE ILS INVESTMENT WHILE MEETING THE SYSTEMS READINESS OBJECTIVE.
301.2.5.3	REAPPLICTN OF FMECA/ RCM TO PRO POSED DSGN CHANGES	ACRONYMS: FMECA - FAILURE MODE, EFFECTS AND CRITICALITY ANALYSIS RCM - RELIABILITY CENTERED MAINTENANCE THIS PROCESS IS A REAPPLICATION OF THE FAILURE MODE, EFFECTS AND CRITICALITY ANALYSIS (TASK 301.2.4.1) TO THOSE ITEMS WHICH ARE ADDED, CHANGED, OR IMPACTED THROUGH THE REDESIGN PROCESS. THE FMECA IS FOLLOWED BY A REPEAT OF THE RELIABILITY CENTERED MAINTENANCE (RCM) ANALYSIS (TASK 301.2.4.2) ON THE SAME ITEMS.

Label	Description
ALTERNATIVE DESIGN CHARACTER-ISTICS	ACRONYMS: FMECA - FAILURE MODE, EFFECT, & CRITICALLITY ANALYSIS RCM - RELIABILITY CENTERED MAINTENANCE THE CHARACTERISTICS OF ONE OR MORE DESIGN ALTERNATIVES THAT WILL CORRECT DEFICIENCIES DISCOVERED DURING IDENTIFICATION OF SUPPORT FUNCTIONS, SUPPORT OPERATIONS AND MAINTENANCE TASK REQUIREMENTS, AS WELL AS CHARACTERISTICS OF ALTERNATIVES WHICH WILL REDUCE OR SIMPLIFY FUNCTIONS REQUIRING LOGISTIC SUPPORT RESOURCES. THE CHARACTERISTICS OF EACH ALTERNATIVE DESIGN BECOMES THE BASIS FOR THE REPEAT OF FMECA/RCM EFFORT(PROCESS 301.2.5.3).
DESIGN DEFICIENCES	A DOCUMENT OR SET OF DOCUMENTS IDENTIFYING THOSE SYSTEM/EQUIPMENT CHARACTERISTICS SHOWN TO BE LOGISTIC SUPPORT RESOURCE INTENSIVE, HAVING A HIGH PROBABILITY OF FAILURE OR CANNOT BE MAINTAINED WITH EXISTING/UNIQUE SUPPORT RESOURCES.
DAMAGE MODE AND EFFECT ANALYSIS RESULTS	ACRONYM: DMEA - DAMAGE MODE AND EFFECT ANALYSIS THE RESULTS OF A DAMAGE MODE AND EFFECT ANALYSIS (DMEA) POINTS OUT THE VULNERABILITY CHARACTERISTICS OF THE SYSTEM/EQUIPMENT DURING WARTIME OPERATIONS AND THE CRITERIA FOR A SURVIVABILITY ENHANCEMENT PROGRAM. REFERENCE: MIL-STD-1629A, "FAILURE MODE & EFFECT ANALYSIS," TASK 104.
DESIGN DEFICIENCY WORK SHEETS	A LISTING OF DESIGN DEFICIENCIES IDENTIFIED IN PROCESS 301.2.5.1A1 THAT HAS BEEN CATEGORIZED AS TO THE APPLICABLE AREA OF DESIGN INTEREST AND ITS SEVERITY LEVEL AS DEFINED IN MIL-STD-1629A. REFERENCE: MIL-STD-1629A "FAILURE MODE, EFFECTS, AND CRITICALITY ANALYSIS."
FMECA MAINTENANCE INFORMATION	THE FAILURE MODES, EFFECTS AND CRITICALITY ANALYSIS WITH MAINTENANCE INFORMATION PROVIDES THE ANALYTICAL DATA NECESSARY TO DETERMINE AND DOCUMENT CORRECTIVE MAINTENANCE TASK REQUIREMENTS AND IDENTIFICATION OF THOSE MAINTAINABILITY DESIGN FEATURES REQUIRING CORRECTIVE ACTION. REFERENCE: MIL-STD-1629A, "FAILURE MODE, EFFECTS AND CRITICALITY ANALYSIS", LSA SUBTASK 301.2.4.1
FMECA DATA	ACRONYMS: FMECA - FAILURE MODE, EFFECTS AND CRITICALITY ANALYSIS LSAR - LOGISTICS SUPPORT ANALYSIS RECORD FMECA DATA, WHICH, WHEN GENERATED IN ACCORDANCE WITH THE REQUIREMENTS IN MILITARY STANDARD MIL-STD-1629A OR WHEN EXTRACTED FROM A LSAR DOCUMENT, PROVIDES POTENTIAL IMPACT OF EACH FUNCTIONAL OR HARDWARE FAILURE ON MISSION SUCCESS, PERSONNEL AND SAFETY SYSTEMS, SYSTEM PERFORMANCE, MAINTAINABILITY, AND MAINTENANCE REQUIREMENTS. REFERENCE: MIL-STD-1629A, "FAILURE MODE, EFFECTS AND CRITICALITY ANALYSIS".

Label	Description
FMECA/RCM RESULTS-- ALTERNATE DESIGN	THE RESULTS OF PERFORMING A FMECA/RCM EFFORT ON THOSE PROPOSED ALTERNATE SYSTEM/EQUIPMENT DESIGNS OR REDESIGNS NOT PREVIOUSLY SUBJECT TO THIS EFFORT ARE REPROCESSED THROUGH PROCESS 301.2.5.1 FOR ANALYSIS AND POSSIBLE REVELATION OF ANY NEW DESIGN DEFICIENCIES. REFERENCE: MIL-STD-1629A AND AMC-P-750-2
INPUTS TO FORMULATION OF DESIGN ALTERNATIVES	ACRONYMS: FMECA - FAILURE MODE, EFFECT AND CRITICALITY ANALYSIS RCM - RELIABILITY CENTERED MAINTENANCE THE DATA ACCUMULATED AS PART OF THE PROCESS 301.2.5.1, "CONSOLODATED DEFICIENCY IN OPERATIONS/SUPPORT FUNCTIONAL REQUIREMENTS" EFFORT, INCLUDING THE FMECA - MAINTENANCE INFORMATION, SUPPORT FUNCTION, UNIQUE SUPPORT FUNCTIONS, PREVENTIVE MAINTENANCE TASKS (RCM), RISKS IN SATISFYING REQUIREMENTS, AND THE QUANTITATIVE SUPPORTABILITY FACTORS, CONSTITUTE THE BASIC INPUTS TOWARD ESTABLISHING DESIGN ALTERNATIVES REQUIRED TO CORRECT DESIGN DEFICIENCIES IN THE SYSTEM/EQUIPMENT.
OPERATIONS AND OTHER FUNCTIONAL REQUIREMENTS	THE RESULTS OF SUPPORT OPERATIONS AND OTHER SUPPORT TASKS IDENTIFIED THROUGH ANALYSIS OF NEW SYSTEM/EQUIPMENT FUNCTIONAL REQUIREMENTS AND INTENDED OPERATIONS NOT IDENTIFIED IN A FMECA OR RCM EFFORT. REFERENCE: LSA TASK 301.2.4.3
PREVENTIVE MAINTENANCE TASKS (RCM)	ACRONYM: FMECA - FAILURE MODE, EFFECTS AND CRITICALITY ANALYSIS THE ESTABLISHMENT OF PREVENTIVE MAINTENANCE (SCHEDULED MAINTNANCE) TASKS FOR A GIVEN SYSTEM/EQUIPMENT, OR CONCLUDING THAT MAINTENANCE TASKS CAN BE PERFORMED ON A "ON CONDITION" (UNSCHEDULED) BASIS IS WHOLLY PREDICATED UPON THE INFORMATION DEVELOPED AND NOTED IN A COMPLETED FMECA DOCUMENT FOR THE SYSTEM/EQUIPMENT. ITEMS OF A SYSTEM/EQUIPMENT IN SEVERITY CLASSIFICATION CATEGORY I (CATASTROPHIC) OR CATEGORY II (CRITICAL), AS DEFINED IN THE CRITICALITY ANALYSIS PORTION OF A FMECA EFFORT, REQUIRES ALL MAINTENANCE EFFORTS TO BE PERFORMED ON A "PREVENTIVE MAINTENANCE" (SCHEDULED) BASIS, WHEREAS, ITEMS IN THE CATEGORY III (MARGINAL) AND CATEGORY IV (MINOR) SEVERITY CLASSIFICATION CAN BE PERFORMED ON A "ON CONDITION" (UNSCHEDULED) MAINTENANCE BASIS. DRIVERS, SUCH AS COSTS, SUPPORTABILITY, AND READINESS COULD MAKE CATEGORIES III & IV ITEMS PREVENTIVE MAINTENANCE ITEMS. THEREFORE, THESE ITEMS AS WELL AS THE CATEGORY I & II ITEMS CAN BE CONSIDERED DESIGN DIFICIENCIES SUBJECT TO CORRECTIVE ACTIONS. REFERENCE: AMC-P 750-2, LSA PROCESS, CHAPTER 4

Label	Description
QUANTITATIVE SUPPORTABLITY FACTORS	DATA APPLICABLE TO OPERATING REQUIREMENTS, NUMBER OR SYSTEMS SUPPORTED, TRANSPORTATION FACTORS, ALLOWABLE MAINTENANCE PERIODS, AND ENVIRONMENTAL REQUIREMENTS, AS A MINIMUM, WHICH HAVE BEEN QUANTIFIED TO ESTABLISH SUPPORTABILITY FACTORS RELATED TO THE INTENDED USE OF THE NEW SYSTEM THE RESULTS OF PREVIOUSLY CONDUCTED MISSION AREA AND WEAPON SYSTEM ANALYSIS WITH QUANTIFIED RELATIONSHIPS BETWEEN HARDWARE, MISSION, AND SUPPORTABILITY PARAMETERS AND APPLICABLE TO THE NEW SYSTEM REFERENCE: LSA TASK 201.2.2
RCM DATA	ACRONYMS: FMECA - FAILURE MODE, EFFECTS AND CRITICALITY ANALYSIS LSAR - LOGISTICS SUPPORT ANALYSIS RECORD RCM - RELIABILITY CENTERED MAINTENANCE RELIABILITY CENTERED MAINTENANCE (RCM) DATA DERIVED FROM THE FMECA DATA DOCUMENTED IN THE LSAR. THIS INFORMATION CONSTITUTES THE BASIS IN THE DEVELOPMENT OF THE PREVENTIVE MAINTENANCE TASK REQUIREMENTS FOR THE NEW SYSTEM/EQUIPMENT. REFERENCE: LSA TASK 301.2.4.2
RECOMMENDTNS TO SIMPLIFY/ REDUCE LOG RQMNTS	RECOMMENDATIONS WHICH ARE PROMULGATED TO OFFER ALTERNATIVE SYSTEM/EQUIPMENT DESIGNS THAT WILL CORRECT EXISTING SHORTCOMINGS IN THE SUPPORT FUNCTIONS. INCLUDES IDENTIFICATION IN THE FUNCTIONAL DESIGN DEFICIENCY WORK SHEETS OF THE AREAS IN A NEW SYSTEM/EQUIPMENT REQUIRING CORRECTIVE FUNCTIONAL DESIGNATION. MAY INCLUDE REDESIGN ALTERNATIVES CONSIDERED AND RECOMMENDED TO REDUCE THE NUMBER OF REQUIRED SUPPORT FUNCTIONS, SUPPORT ACTIVITIES, OR SUPPORT RESOURCES, OR SIMPLIFY (IF REDUCTION IS NOT POSSIBLE) SUPPORT FUNCTIONS THAT ARE RESOURCE, READINESS, OR COST DRIVERS.
RISKS IN SATISFYING REQUIREMENTS	IDENTIFICATION AND DOCUMENTATION OF THOSE RISKS ASSOCIATED WITH AND AFFECTING THE PERFORMANCE OF SPECIFIC SUPPORT FUNCTIONS, UNIQUE SUPPORT FUNCTIONS (IF ANY), AND THE PREVENTIVE MAINTENANCE TASKS. IN LIKE MANNER DOCUMENTATION OF THOSE RISKS ASSOCIATED WITH SUPPORT EFFORTS SUBJECT TO COST DRIVERS. REFERENCE: LSA TASK 301.2.3
SUPPLEMENTAL LSAR DATA	ACRONYMS: FMECA - FAILURE MODE, EFFECTS AND CRITICALITY ANALYSIS LSAR - LOGISTICS SUPPORT ANALYSIS RECORD RCM - RELIABILITY CENTERED MAINTENANCE ANY INFORMATION, WHETHER IT BE TECHNICAL OR OTHER, APPEARING IN THE EXISTING LSAR FILE AND WARRANTING CONSIDERATION IN THE PERFORMANCE OF THE FMECA/RCM PREPARATION FOR EACH PROPOSED SYSTEM/EQUIPMENT ALTERNATE DESIGN

Label	Description
SUPPORT FUNCTIONS	DOCUMENTED AND IDENTIFIED SUPPORT FUNCTIONS NECESSARY TO MAINTAIN A NEW SYSTEM/EQUIPMENT IN A FUNCTIONAL AND OPERATIONAL CONDITION, WITHIN ITS INTENDED OPERATIONAL ENVIRONMENT. PEACETIME OR WARTIME (OR BOTH) OPERATIONAL CONDITION, INCLUDING THE SPECIFIC EQUIPMENT FUNCTION/DESIGN CHARACTERISTIC REQUIRING SUPPORT IDENTIFIED AND DOCUMENTED INADEQUACIES OF A SPECIFIC SUPPORT FUNCTION, OR INABILITY TO ESTABLISH A SUPPORT FUNCTION FOR A GIVEN CONDITION OF THE SYSTEM/EQUIPMENT REFERENCE: LSA TASK 301.2.1
UNIQUE SUPPORT FUNCTIONS	SUPPORT FUNCTIONS WHICH CAN BE CONSIDERED "UNIQUE" WHEN COMPARED TO EXISTING OR SIMILAR SYSTEMS EQUIPMENT NEW SYSTEM/EQUIPMENT CONTAINING NEW DESIGN TECHNOLOGY, NEW OPERATIONAL CONCEPTS, OR WHICH ARE SUPPORTABILITY, COST, OR READINESS DRIVERS IDENTIFIED AND DOCUMENTED INADEQUACIES OF A SPECIFIC SUPPORT FUNCTION OR INABILITY TO ESTABLISH A SUPPORT FUNCTION FOR A GIVEN "UNIQUE" CONDITION OF THE SYSTEM/EQUIPMENT REFERENCE: LSA TASK 301.2.2

Name	Label	Description
LSAR	LSAR FILE	ACRONYMS: ILS - INTEGRATED LOGISTIC SUPPORT LSA - LOGISTIC SUPPORT ANALYSIS LSAR - LOGISTIC SUPPORT ANALYSIS RECORD THE LOGISTIC SUPPORT ANALYSIS FILE (LSAR) OR RECORD HOLDING AREA CONTAINS LSA TASK REPORTS OR THE EQUIVALENT (LSAR MASTER RECORD SHEET INFORMATION OR LSAR REPORTS). WHEN THE SYSTEM IS AUTOMATED IT CONTAINS LOGISTICS DATA WHICH CAN BE USED TO ASSESS VARIOUS ILS ELEMENTS. MIL-STD 1388-1A AND 1388-2A SHOULD BE LOOKED AT FOR COMPLETE OUTPUTS.

Name	Label	Description
DEV/ALT/DSGN	DEVELOP ALTRNATIV DESIGN/ REDESIGNS	ACRONYMS: LSA - LOGISTICS SUPPORT ANALYSIS THE PRIMARY FUNCTION OF THE LOGISTICIAN IN THIS LSA TASK IS TO PARTICIPATE IN FORMULATING DESIGN ALTERNATIVES TO CORRECT DESIGN DEFICIENCIES UNCOVERED DURING THE IDENTIFICATION OF FUNCTIONAL REQUIREMENTS OR OPERATIONS AND MAINTENANCE TASK REQUIREMENTS. THIS EXTERNAL ENTITY REFERS TO THAT ACTIVITY, GROUP, OR OCCASION IN WHICH THE DESIGN REVIEW TAKES PLACE, AND ALSO WHERE THE LOGISTICIAN IS PARTICULARLY INTERESTED IN INTRODUCING THOSE FACTORS WHICH MAY REDUCE OR SIMPLIFY FUNCTIONS REQUIRING LOGISTIC SUPPORT RESOURCES.

ANNEX C

STRUCTURED SYSTEMS ANALYSIS

Fundamentals

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STRUCTURED SYSTEMS ANALYSIS

Fundamentals

Structured Systems Analysis (SSA) has recently become an industry standard for generating Data Flow Diagrams (replacing "logic diagrams" or "flow charts") to aid in coordinating the functions to be performed by a computer program and its associated Inputs/Outputs (I/O). During the SSA, each set of "flow charts" can be checked by the potential user to assure that there is complete agreement on what is to be done by the program, and how it is to be accomplished. It also provides considerable flexibility for updating or changing the program.

Six basic elements are used in SSA:

1. Process (PRC)
2. Data Flow (DAF)
3. Data Store (DAS)
4. External Entity (EXT)
5. Data Flow Diagram (DFD)
6. Data Dictionary (DCT)

PROCESS (Represented by a Circle):

A function or operation to be performed which can be explained by a set of instructions representing a single task, e.g., "calculate interest on a loan", "prepare a draft report". If the Process description is too complex to describe in a few steps, it may be necessary to develop a lower level description (see below).

DATA FLOW (Lines interconnecting Processes or I/Os):

Each function or Process cannot be a stand-alone in a complex network. To have any meaning in a program, each process must be initiated by a previous action and/or provided information on which to act. Furthermore, a Process must result in an output which is the input to the next logical Process. These inputs, outputs, or initiating actions are identified as Data Flows, and are represented by the Data Flow lines indicating its point of origin and the process to which it provides data.

DATA STORE (Represented by two parallel lines):

Although some Processes generate data used as input to a succeeding Process, there is often a need to "gather or collect" information from files in which it is stored. This information may come from an external source (such as a MIL-STD, Army regulation, historical experience files, etc.), or an internal source or file in which data is temporarily stored for use by succeeding processes. These Data Stores can be visualized as a "file cabinet", in which the data are stored for later retrieval).

EXTERNAL ENTITY (Represented by a Rectangle):

Each program or logical process must have an initiating action, a "point" of disposition of the results, and possible input guidance or instructions. Each of these have authorities, functions, or applications which are independent of the program Process (although required by the program Process). Thus, these activities, agencies, or facilities are considered "External Entities" to the program.

DATA FLOW DIAGRAM:

The general arrangement of the above can be readily seen. First, the circle or Process describes what has to be done; the interconnecting lines represent the Data Flows, together with the specific description of all I/Os. The Data Stores identify the source and/or file designation of a data base, and the External Entities represent those activities remote from the Process, which are the source of guidance or the recipients of the program. This combination of Processes, Data Flows, Data Stores, and External Entities constitutes a "Data Flow Diagram". The unique feature of the Data Flow Diagram (DFD) is that each process can be considered independently, permitting a change to be made in one Process without a major change in the overall program.

DATA DICTIONARY:

The Data Dictionary consists of a complete description of each of the basic elements. For the Process, it contains a step-by-step description of what has to be performed. The description of the Data Flow identifies the nomenclature of the data, a detailed description of its content, and its source. The Data Stores and External Entities are described, including possible location.

The Data Dictionary (a living document) begins with a description of the first Process and is continually built-up as the Data Flow Diagrams are expanded, detailed, and eventually completed.

APPROACH TO PERFORMING STRUCTURED SYSTEM ANALYSIS:

The best approach to Structured Systems Analysis is to assume that the program consists of a series of processes, each of which are to be assigned to an inexperienced analyst. Each analyst is to be walked through the assigned process of the Program, explaining step-by-step what functions have to be performed or what actions have to be taken to accomplish the process. The analyst is also informed where the information is coming from (input Data Flow), what is to be generated by each process (output Data Flow), where the data base may to be found (Data Stores), and who to contact for guidance (External Entities).

The best way to initiate a SSA is to set down the point of origin of a program, its final goal(s), and the intermediate functions or actions needed to get from beginning to goal. Each step should be considered as a Process - some may be sequential and others parallel. Then, the steps needed to accomplish the Process should be described. If the description is complex and needs intermediate steps, the Process is then a candidate for an "explosion". That is, the top (or upper) level Process is considered as a "project" and its own Data Flow Diagram is prepared.

When writing the step-by-step procedures in the Process, certain elements of data (or information) must be made available for the procedure. Each element of data is considered as an input Data Flow, which is identified and described. The product (or result) of a Process is an output Data Flow element.

Each Data Flow to the Process must originate from:

1. an earlier Process
2. a Data Store (or file)
3. an External Entity.

These sources are also identified, described and put into the Data Dictionary. As soon as the last portion of the Data Flow Diagram has been described, the SSA is complete.